DEEP ENERGY EFFICIENCY AND GETTING TO ZERO

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Executive Director

new buildings institute

- Non-profit, think tank on commercial building energy efficiency
- Formed in December 1997
- Funding
  - Sponsors: includes SCE, NEEA, NationalGrid, NYSERDA, CEC, SMUD
  - Contracts and Grants: EF, DDCF, Kresge, USGBC, CEC PIER, CPUC, etc.
- Staff in Vancouver, Seattle, and White Salmon, Washington

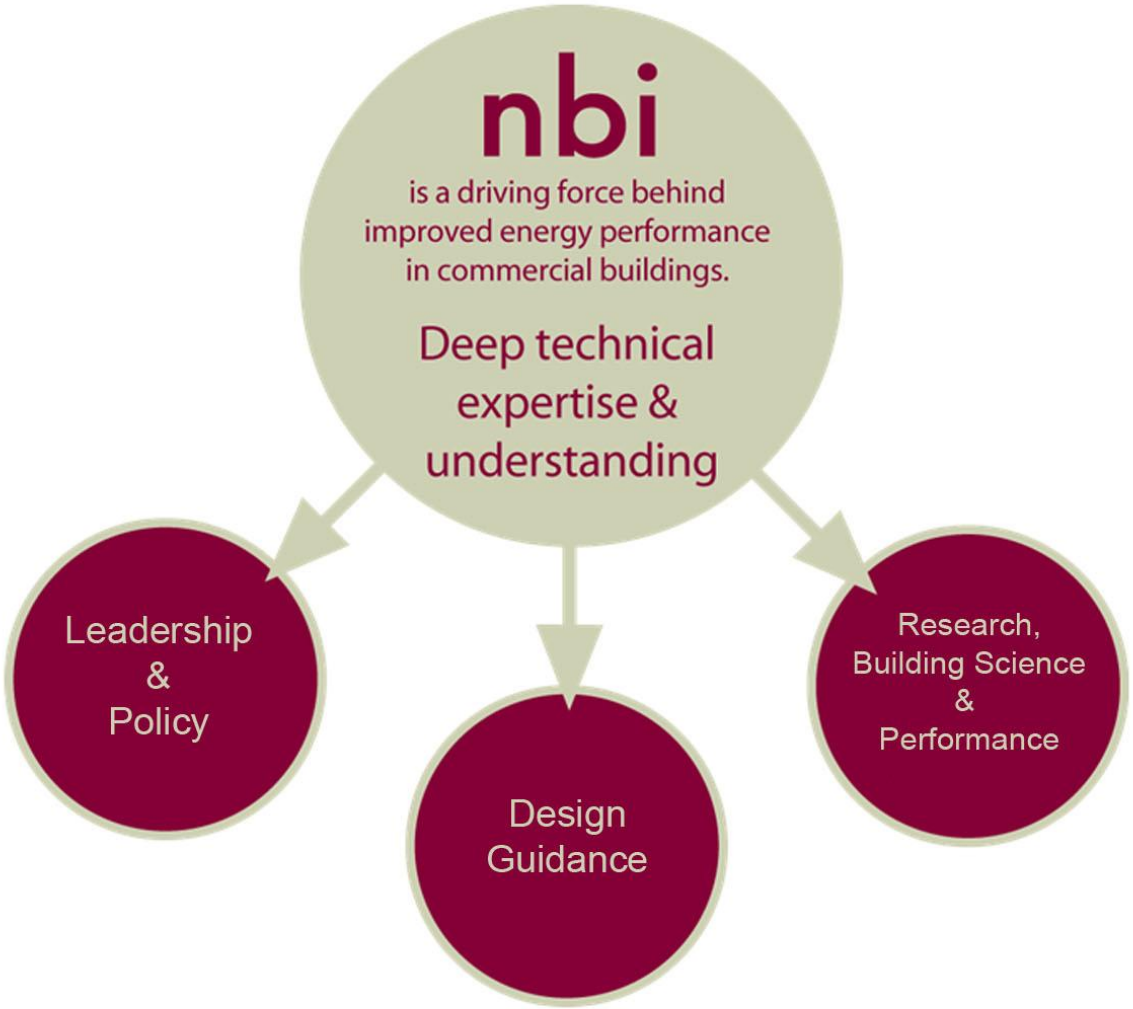
Intro

Research, Building Science & Performance

Design Guidance

Leadership & Policy

nature of our work



key topics for today

- What do we know about the features and actual energy use of high performance buildings?
- What is possible in terms of energy performance in the near term?
- How we can structure programs, policies and market actions to support deep efficiency?
- New Tools

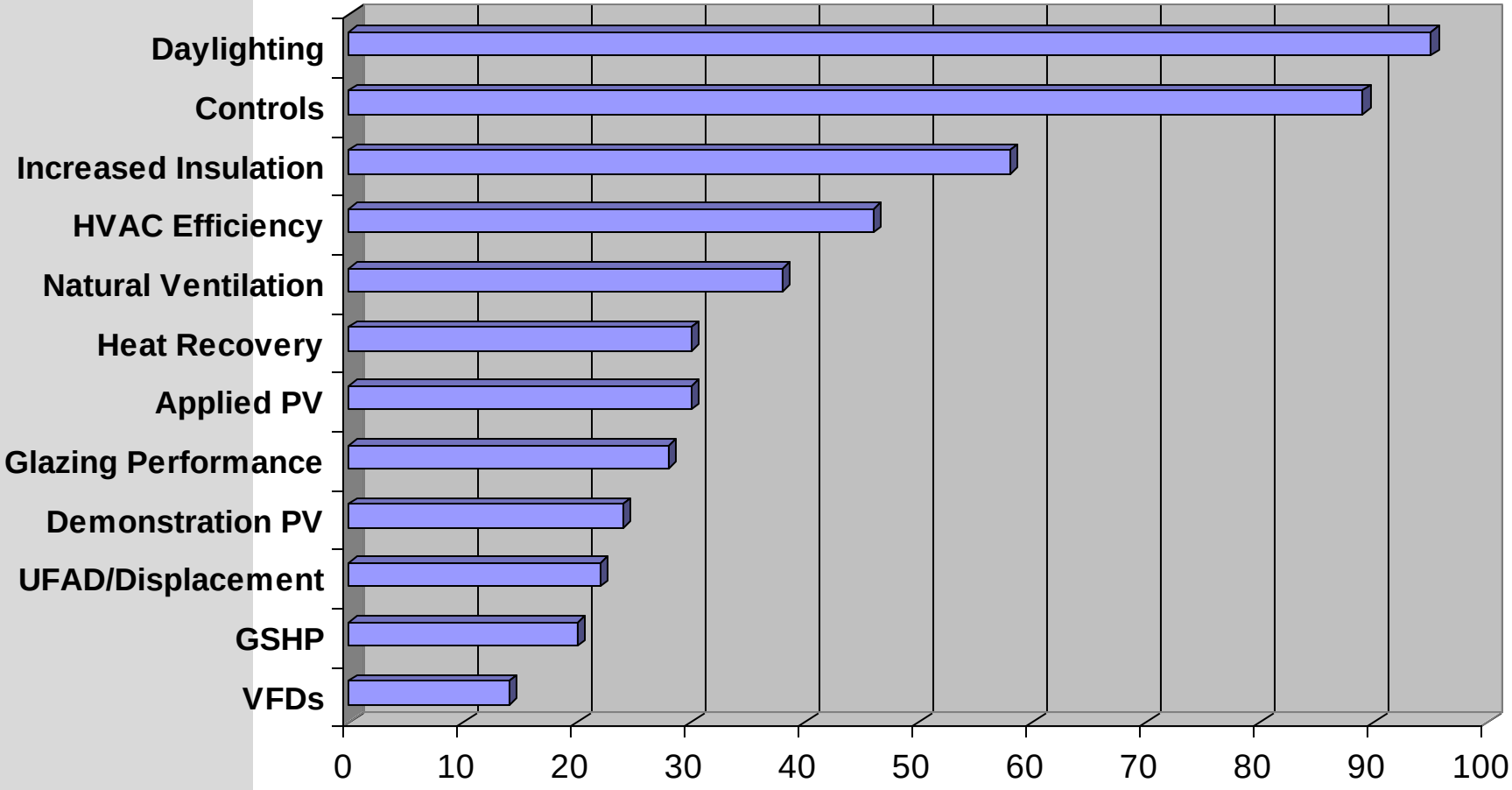
first, getting to fifty - new

- NBI identified about 100 buildings around the country that had energy performance (at least estimated to be) 50% better than typical.
- Reviewed feature sets, and created a database of projects.
- Sponsored a two day planning event in Atlanta to determine how to get more 50% buildings constructed.

findings from GT50 buildings

- Fewer that 1 in 1,000 new buildings reach this level of efficiency
- It is possible across multiple building types, multiple climate zones, multiple design teams
- Largely driven by the owner, with support from public and/or utilities.
- How do we spread the motivation, skills and support to get buildings at this performance level? (IECC 2012?)

technologies in GT50 buildings



recent buildings: U.S./Northwest and German demos

Building Type	U.S./ NW Average New Bldgs.	U.S./ NW LEED Buildings	German Demos	
Offices	88/ 93 kBTU	62/ 60 kBTU	27.5 kBTU	
Schools	81/ 65 kBTU	62/ 33 kBTU	19.4 kBTU	

nbi new buildings INSTITUTE

Intro

Research, Building Science & Performance

digging into buildings and data

- Detailed look at 50+ HP buildings
- Best of Best – advanced mechanical, daylighting, advanced controls, natural ventilation plus pay attention
- Worst of Best – usually no clue that building not performing, mostly operational issues, occasionally design or construction; Cx post occupancy should fix most
- Ongoing measured performance of buildings is critical

what about zero-net energy buildings?

- About 15-20 built in U.S.
- (Identified about 50 net zero capable – i.e. less than 30 kBTUs site)
- Except for NREL, mostly small
- All the basics plus very efficient HVAC, daylighting, natural ventilation, heat recovery
- 50+ projects under design/ construction, e.g. Living Building Challenge, Saving by Design, ETO

two critical projects

- California Zero Net Energy Action Plan
  - One of several Big, Bold Goals
- Zero Energy Commercial Buildings Consortium
  - Market and Policy Report
  - Technology Report

Big Bold Goals



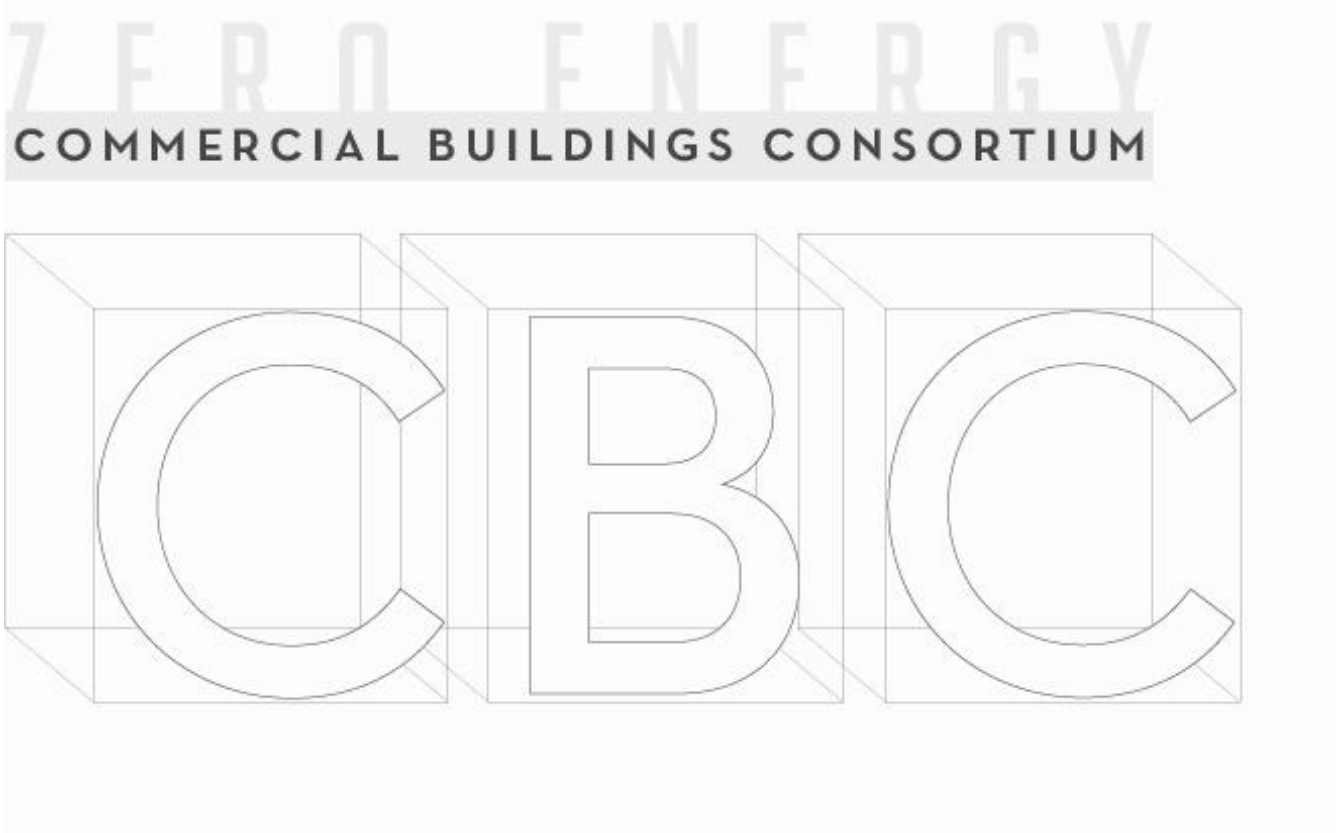

- All new residential construction in California will be zero net energy by 2020
- All new commercial construction in California will be zero net energy by 2030 and 50% of existing buildings.
- Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate
- All eligible low-income customers will be given the opportunity to participate in the low income energy efficiency program by 2020.

Champions Network

CBC Goals and Objectives

- Characterize barriers and challenges and recommend solutions
- Coordinate with industry to act on those recommendations
- Provide broad industry perspective to programs and strategy at the state, regional, and national levels
- **Ultimate Goal**—Accelerate market transition to net-zero energy commercial buildings

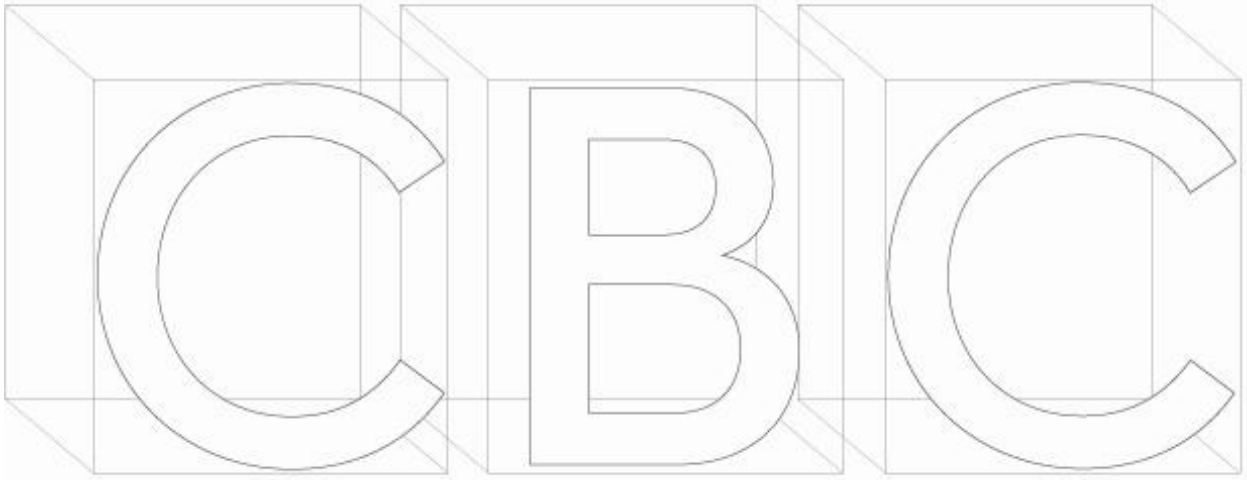
CBC Leadership: Steering Committee



NEXT GENERATION TECHNOLOGIES REPORT CONCLUSIONS AND FINDINGS

ZERO ENERGY

COMMERCIAL BUILDINGS CONSORTIUM

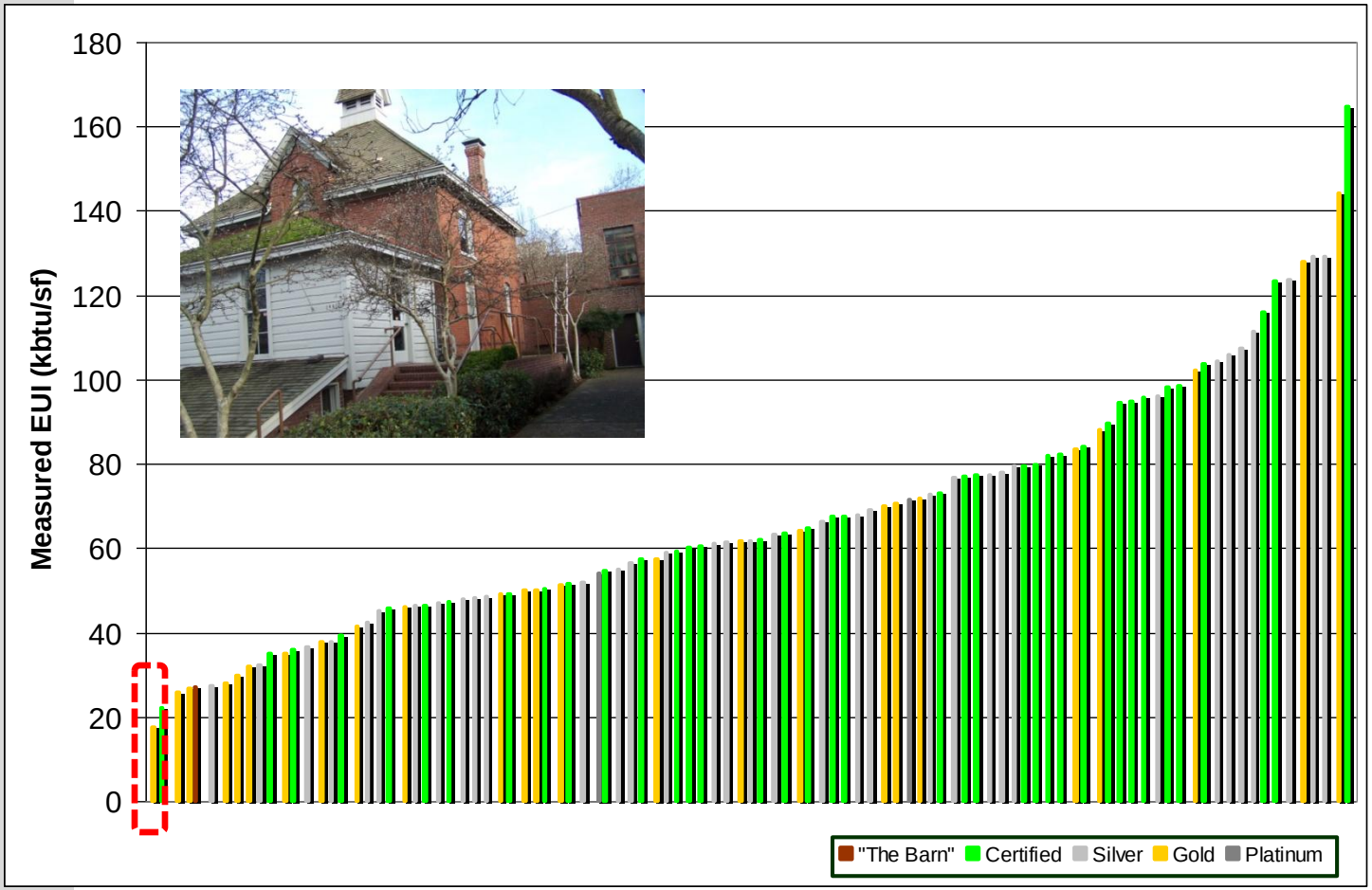


ANALYSIS OF COST & NON-COST BARRIERS AND POLICY SOLUTIONS CONCLUSIONS AND FINDINGS

Cross-Cutting Themes

- **Integrated design** is more critical to the development of low/zero-energy buildings than is any given technology.
- Moving beyond design and construction into operations, plug loads, process energy and other **“unregulated loads”** is a critical step.
- There is need for a **consistent, long-term metric** to measure the performance of buildings and policy, such as the Zero Energy Performance Index (zEPI).
- **More measured performance data** at the case-study level, the system level to support owner and private financing.

the barn – built in 1887

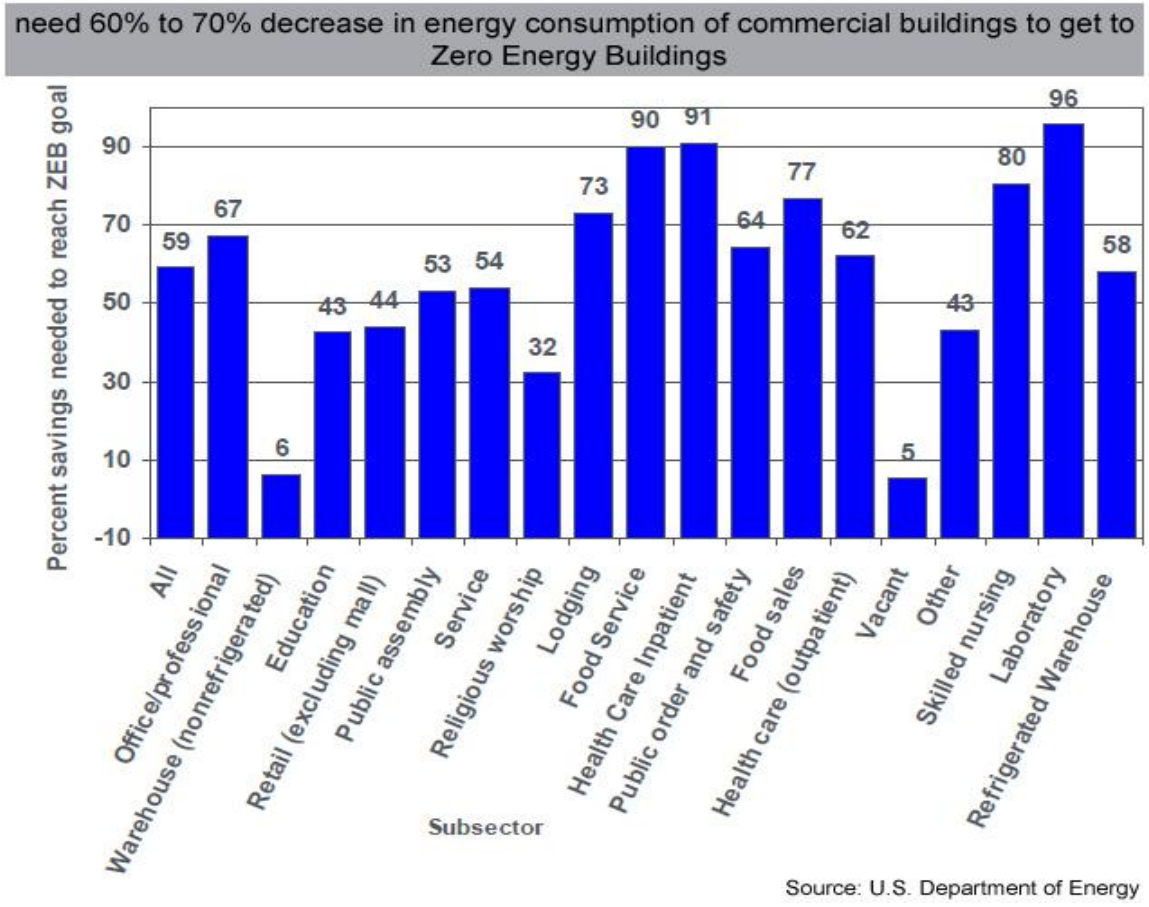


NBI Study of the measured performance of 100 LEED buildings.

existing buildings

- California Plan includes 50% of existing buildings to net zero
- NBI and National Trust for Historic Preservation identified 50 existing buildings with documented savings in the 30% to 80% range.
- Taking a deeper look now, but requires changes to at least two buildings systems

getting to zero in existing buildings



how to move existing buildings

- Create and support innovative technical solution sets that build on the strengths of existing buildings.
- Critical need for new financial tools that can support deep savings (40% to 60%)
- Move from widget based efforts to integrated system based efforts with enhanced controls.

five strategies for moving the market

1. Performance Goal Driven
   - Focused on achievement of an absolute number – for most buildings 25 to 40 kBTU/sq.ft. site: Measured
   - Brings in operations and plug loads
2. Strong utility and public program support
   - Big, Bold in CA (Path to Zero)
   - ETO has similar program element
   - TRC is an issue

five strategies for moving the market

3. Need to focus on Collaborative Learning
   - Review high-performance buildings
   - Track Key Performance Indicators
4. Reduce performance risks and cost of changing practice

   Move from Case Studies to

   Lessons Learned to

   Design Guidance

five strategies for moving the market

5. Understand the motivations of and work with key decision makers (owners, developers, finance, design community)

Design Guidance Projects

- Advanced Buildings
  - Core Performance
  - Developing a 50% package
- Advanced Lighting Guidelines
  - Web-based tool connected to CLS
- Office of the Future
  - Tenant Improvement; lights and plugs
  - 50% solution beginning research

Advanced Buildings

ALG Advanced Lighting Guidelines

ADVANCED ENERGY OFFICE
EFFICIENCY·PRODUCTIVITY·CONTROL

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ALG Online

Intro

Research, Building Science & Performance

Design Guidance

Daylighting Pattern Book

- Visual guidance based on real examples
- Series of variations
- Also an Office Interiors guide

Photo by Gary Hall Photography

Office of the Future Consortium

- Integrated technical solutions in existing office TIs
- Lighting, plug loads, HVAC performance, metering
- Initial pilots show robust savings

Deep Efficiency in Existing Buildings

- Best examples
- Developing new tools
  - First view, operational diagnostics
  - Multi Measure Tool; Pre-modeled solution sets for common buildings
- Summit meeting in Boulder CO
- June 28-30

Thank you

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